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COMPARATIVE ANATOMY AND PHYSIOLOGY

Comparative Anatomy and Physiology. By F. Jeffrey Bell, M.A., Professor of Comparative Anatomy at King's College, London. (London: Cassell and Co., Limited, 1885.)

THIS work is one of a series of "Manuals for Students of Medicine," each of which is to be "compact and authoritative"—"embodying the most recent discoveries," and also to "contain all the information required for the medical examinations of the various colleges, halls, and universities in the United Kingdom and the Colonies."

On behalf of those of our readers who may be unfamiliar with the demands of certain of the examining bodies referred to above, it may be well to state that nothing but a *résumé* of all that is known in the subject could meet the requirements of the case. That which the publishers demand, and which the public therefore has a right to expect under the conditions laid down, is an ultra-condensed digest of all authoritative work in zoology and physiology. Incredible though this may appear to any one acquainted with the bibliography of the subject, Prof. Bell's manual is so far satisfactory that we cannot but congratulate the publishers upon their choice of an author, whose work in connection with the *Journal of the Royal Microscopical Society* and the *Zoological Record* render him *par excellence* the man for this *opus mirabilis*. When it is stated that there are but 548 pp. to the book it will be clear that it must be a vast collection of facts, little being left as to style or originality for that criticism which the author invites. The method of treatment, however, is somewhat novel, and in our opinion open to comment.

The author divides his work into fourteen chapters. Of these the first is introductory; the second is devoted to the Amœba as a physiological study; the third to "the general structure of animals," that is, to a consideration of the "broader characteristics of the groups into which the animal kingdom has been divided." Those which remain are devoted, each to one of the great systems of organs and to development.

In estimating the value of this volume, it must be clearly borne in mind that it is a book intended for beginners. Chapter II. is written for biological babes, and it will be clear to any one who reads the volume that the author would have the student familiarise himself with the facts in the order in which they are presented to him. This being so, it is a pity that Chap. I. should have been so largely devoted to the subtle details of cell-structure; the beginner is lost in descriptions of the "cytod" and the "cell," for each of which broad differences are dogmatically formulated, such as would tend to bias the mind of the average student. Draw hard lines by all means for the beginner, but not in such delicate matters as these. Only by working from the known to the unknown, can the student of science ever hope for success; the order of his elementary studies must be a recapitulation of that in which the science itself has advanced—he must here begin with gross anatomy, and we believe that to treat first of the subtle details of cell structure is to do violence to the cause of inductive science. A somewhat similar comment may be offered upon the manner in which the great phyla are dealt with in Chap. III. Having devoted nearly half the chapter to defining these, the author proceeds (pp. 58, 59) to deal with types of each. He prefers to commence with the Echinodermata, dealing thus "first of all" with the "most aberrant" phylum. If the Echinoderms are dismissed as a stumbling block, why not the Brachiopods, the Polyzoa, and certain other creatures well known to zoologists? These are all wisely relegated to the end of the chapter, as "groups of animals which in the present state of our knowledge cannot be satisfactorily placed with any of the great phyla" (p. 100). Just so, but why not put the Echinoderms there also If the student is to be allowed the exercise of any judgment in the matter, he cannot be expected to deal with the aberrant before he is familiar with the normal, and more stereotyped grades of organisation.

Although the work is professedly a text-book of comparative anatomy and physiology, the latter branch has suffered much in the process of condensing, necessary we presume in order to keep the book within the prescribed limits. At the commencement of each chapter a concise definition of that system of organs to be dealt with comparatively is given, together with a brief description of their functional activity; but the field of comparative histology is sorely neglected. The author neither furnishes the required information on this subject, nor does he take for granted that his readers have worked through even the broad principles of it. The student is occasionally referred (*Ex.* pp. 368 and 372) to Klein's "Manual of Histology"—a fellow volume to the one now before us; but as that work deals with the subject altogether from a special human-anatomist's point of view, the reader is at a loss to make much of the subtle differences in the comparative anatomy of, say, shells and teeth, until he knows more precisely than he is here informed what is involved in an exoskeleton and a tooth. Similarly, the statements made (p. 258) concerning the vertebrate excretory system are altogether too brief and dogmatic. The student is merely informed that *Meso* and *Metanephros* exist; of their adult structure he learns little or nothing, and in the face of such descriptions of the essential structure of an excretory organ as are given, he would be at a loss to make much of that of the vertebrate at any rate for himself.

Chapters V. and VI. are also at a disadvantage from this curtailing of the histological portion of the subject. The definition of the blood given (p. 181) would not convey to the beginner's mind a notion of its real complex nature; he would rather infer that it is merely "the result of the process of digestion," in function "respiratory as well as nutrient." Least successful of all the definitions given of great systems is that (pp. 393-94) of the nervous system, and it is exceedingly unfortunate that (p. 411) the nerves should be described as bringing or carrying "messages." A fascinating conception of the nervous activity this may be, but it is a commonplace one, well known to every teacher of physiology; the mischief attendant upon its use is patent, and it is highly desirable that special efforts should be made to secure its abolition. Its adoption in this work is therefore greatly to be regretted.

Prof. Bell's book is fully up to the date of writing, and the subject-matter is for the most part judiciously

selected and arranged; but in a volume where so much of fundamental importance to the student is recorded, we could wish to see more discretion used in the transcription of certain hypotheses. We frequently find the most elementary facts set down side by side with the most daring generalisations. Nowhere is this more conspicuous than on p. 85, where Hubrecht's well-known Nemertean-Vertebrate hypothesis is referred to. The author mentions this with a caution it is true, but its introduction in the manner adopted, and with the illustrations given, is out of place. Again, a teacher is not justified in telling a novice as a *procès verbal* in an elementary text-book that "the Echinodermata, the Arthropoda, and the Mollusca form (p. 84) three very distinct branches or phyla, the common ancestor of which is to be sought for only in a simple worm." Neither is he justified in asserting (p. 403) without further qualification than is here given, that "with the exception, then, that in Peripatus and Proneomenia, the anterior end of the nerve-cords is enlarged into a cerebral mass, we should appear to be able to see no essential difference between them and a Craspedote Medusa, save in fact that the Medusa has a complete nerve ring." Statements such as the above may prove in the long run to be expressive of the truth, but if introduced into a text-book, efforts should be made to convey to the mind of the student some notion of what they involve. The beginner is too ready to rely upon his teacher and his text-book at all times, and the admixture of elementary facts with startling hypotheses is—in a work of this order—directly opposed to the true scientific principle. The natural tendency to generalise prematurely needs to be checked rather than otherwise, and if countenanced by a teacher, it must lead to fallacies greater and more mischievous, than were those of the catastrophic school.

There is a dangerous sketchiness about certain portions of this work. For example, on pp. 185 to 193 there is instituted a brief comparison of the great blood-vessels in the leading groups of animals. The descriptions given would lead one to infer that the antennary, hepatic, and sternal arteries of the Crustacean, and the auricles of Mollusca, are serial homologues of the circular commissures of a worm (here called "transverse"); this is in fact stated (pp. 186, 189) to be the case. The argument used above applies equally well here, and we are at a loss to imagine the state of him who, with the aid of this book, shall try to ascertain the actual condition of these vessels in the admittedly all-important worm.

When we reflect upon the advisability of placing this work in the hands of the average medical student, it must be admitted that it is not calculated to be of much service to him during his ordinary student life, except as a cram-book for the examination-room. The author has, by the terms of his agreement, pledged himself to produce a *précis* of all that is of first importance on the subject. The work will be very valuable as a remembrancer and book of reference to those who already know something definite of the broad principles of the science, and we conceive of it as calculated to be of especial service to geologists and others, whose work among the "dry bones" occasionally needs the light from within. So far as the medical student is concerned, it must be admitted that he is overtaught, and it is monstrous to reflect that there exist systems of medical education, such as have necessitated the production of this book as a "Manual for Students of Medicine." The days for "signing up" attendances on long courses of lectures upon zoology and botany are—or ought to be—numbered; and if, as is most desirable, the biological leaven is to be introduced into the medical curriculum, it can only be done to good purpose along lines such as have been successfully laid down, mainly by Prof. Huxley.

There is undoubtedly a need of a sound elementary book, which shall be up to date, on "the general structure of animals," and Chap. III. of this volume supplies the want in a measure. The paucity of certain parts of this, however, is a serious obstacle to its adoption, for diagnoses such as are given for the Scaphopoda (p. 82), for the Copepoda (p. 68), and for the Siphonophora, are of little avail.

Taking the book as a whole, the success with which the author has performed his task will be obvious to any one cognisant of the immensity of the field. Small errors cannot well be excluded from a work of this kind, but the volume contains some which ought to be rectified as soon as possible. For instance, there is no good ground for stating (p. 359) that the sesamoids are "no doubt to be explained by a reference to the primitively multiradiate condition of the vertebrate limb," and there is something akin to a contradiction in the assertion (p. 140) that the teeth are "developed from cells of epiblastic origin," and that there is "a community of origin between what have been well called dermal denticles and what we call teeth." One remarkable instance of the manner in which errors of observation may be spread and distorted in the process of abstracting, is to be found on pp. 301 and 377, where we read that the telson "sometimes, though very rarely (Scyllarus), *bears minute appendages*." We mention this as the author lays stress upon it, and unless we are mistaken in the identity of the paper from which the above idea has been culled,[1] an attempt was merely made to show—and that unconclusively—that "the telson is a true body segment with lateral appendages, which are modified by cohesion and adhesion." He who abstracts cannot be expected to verify the accuracy of every statement he reproduces—life is too short for that—but a matter such as the above should not have been allowed to pass. In defining the Arachnida (p. 72) it is stated that "the mouth is never placed so far back that any of the appendages become antennary organs." This is but one view of a complicated and deeply involved question, and, even should it chance to be true in the end, it is but a deduction at the most, and its use here as a definition is unwarrantable. This same deduction underlies the statements made on p. 303 under a similar head, and also the insertion of the foot-note uncalled for to p. 224. The first mention of the "transverse processes" of the vertebra (p. 314) as "given off" from the centrum is to be regretted, as it leads up to a complete misunderstanding of the nature of the component parts of the adult vertebra; and, passing (pp. 324-25) from a somewhat jerky description of the vertebral column, it is doubtful how far it is wise to usher in so complex a subject as that of the skull, by a direct appeal to embryology. The statement (p. 325) that the trabeculæ "never form more than an

[1] Garrod, *Journal of Anatomy and Physiology*, May 1871.

imperfect roof" in the region of the fore-brain, hardly accords either with fact or with the characters delineated in Fig. 138. In dealing with another complex matter—the origin of the fœtal membranes—the student's attention is abruptly transferred (p. 509) from the vitelline membrane to the amnion, and that in such a manner that he would scarcely follow what is really meant. Closely allied is the description of the germinal layers, and we doubt if the bare statement (p. 34) that "the outer and inner layers undertake the functions which their position entails on them" is justifiable.

The work is got up in good style. The technical terms are printed in large type, but the choice of these is not always happy; on p. 5, for instance, in describing the movements of living protoplasm, we find the words "stream" and "gliding" set up in large letters; while, on p. 12, where the time-honoured terms "ontogeny" and "phylogeny" cannot well be dispensed with, neither they nor equivalents are employed—in fact, but for the aphorisms quoted on p. 13, the arguments used under the head of "development" would hardly carry conviction. Considering the nature of the book there are very few typographical errors. The more important are: p. 49, the description of Aspidogaster as "*ecto*parasitic;" p. 138, the "*anterior posterior* of the digestive tract;" and, p. 501, "the *cephalous* Mollusca, such as the mussel," &c. The illustrations are, for the most part, fairly good. Fig. 11, representing, as it does, only one-half of an anemone, is not easily intelligible to the reader, and the student should be informed what the right half of Fig. 22 is intended to illustrate. Fig. 66 illustrates but feebly part of an important subject—Mammalian odontology—which is poorly dealt with. Figs. 36, 42, 81, 82, 101, 170, and 192, are all out of place in a work of this kind. They convey little or no impression to the mind of the student, and are bare schemes such as an observer might construct for use in his own private notebook *side by side with actual drawings of the facts observed.* Diagrams such as Fig. 101 should never be shaded up, as if indicative of actual appearances.

To sum up. The author has successfully produced, at immense labour, a volume, of service to those who already possess a practical knowledge of the broad principles of the subject. A "Manual for Students of Medicine" it emphatically is not, except under that atrocious and misdirected *régime* of parrot-work not yet extinct. For this the system, and not the author, is to blame; he has performed a good service, the return for which will but ill repay him. G. B. H.

BRITISH DAIRY FARMING

British Dairy Farming. By James Long. (London: Chapman and Hall, 1885.)

THIS very readable volume is from the pen of one who evidently understands the highly technical subject to which he has devoted himself. Writing upon agriculture has too often been attempted by mere theorists, and as an inevitable consequence practical men have been contented to cursorily scan and forthwith consign both book and author to oblivion. In this department more than in many others those who know are not book-writers and those who are book-writers do not know. Mr. Long is happily able to exercise the discernment which comes of knowledge in the marshalling of his facts and the quality of his suggestions. In his introductory chapter he gives solid statistical reasons why we should as a community endeavour to "produce more and import less," and the subsequent chapters are devoted to a review and comparison of our dairy system and those of our Continental neighbours, much to the advantage of the latter. The genius of the English farmer does not appear to have as yet shone into his dairy. His fields, his machines, his cattle stalls, his animals, have each and all been the admiration and the model of Europe and America. But he pauses on the threshold of his dairy and, we may add, his hen-house. These are, he thinks, the proper domain of the dairy-maid or the housewife, and the farmer is done with the milk when he has set it down at his dairy door.

It is a case parallel with that of our *cuisine.* We produce the finest beef and mutton, but we are only too constantly reminded of the forcible old proverb that while God sends meat the Devil sends cooks. There is some ground for hope that we shall, if only by force of competition, be compelled to further elaborate our products. English cheese is excellent, but it is lamentably wanting in variety, and certainly is much too apt to be regarded as one of the necessaries rather than as one of the amenities of our daily fare. Butter-making offers fewer facilities for innovation, but much requires to be done before we can successfully compete with the butter-makers of Denmark, Normandy, and Brittany. It is to cheese-making that Mr. Long devotes the largest share of his space. In England the principal cheeses may be almost told off upon the digits of one hand: they are "Stilton, Cheshire, Cheddar, Gloucester, Derby, and Leicester." The two last are, however, a little less definite than the first four, and we do not quite see their right to continue a list so well begun. Derby and Leicester are, no doubt, very good cheeses, but if they are to be admitted to stand in the same relation to English dairying as Stilton and Cheddar, we think Mr. Long might well have increased his list by adding Cutherston, Dorset-blue, North Wilts, and other cheeses well known to thousands of admirers. The principal English cheeses are, however, undoubtedly the first four mentioned in Mr. Long's list, and, with the exception of the Stilton, none of them can compare, in the estimation of an epicure, *connoisseur*, or *gourmand*, with the soft, rich, palatable cheeses imported to this country under a puzzling variety of appellations.

The chief interest of Mr. Long's book consists in his minute workable descriptions of the manufacture of a large number of cheeses, which indeed appear to be as numerous and various as are different sorts of wines. The book is well illustrated, and the "plant" required for carrying on the manufacture of some of the cheeses is complicated and expensive. Still, there appears to be no reason why similar cheeses should not be successfully made in England, and it is not improbable that the processes would be further improved in English hands were the matter once taken up.

Take, for example, Camembert:—

"The rennet is added to the milk at a temperature similar to that at which it is drawn from the cow: it is heated in a tub, and a portion of the morning's milk is added to the milk